Red Teaming in EM Space

By Richard P. Johanning and Jason C. Winn

Editorial Abstract: The authors examine the limitations of the electromagnetic training environment, including procedural and technical complexities. They present enhancements to the Joint IO Range as a current, realistic working solution.

Marine Corps Reference Publication 3-01A, *Rifle Marksmanship*, states the following regarding fundamentals of marksmanship:

"For rifle fire to be effective, it must be accurate. A rifleman who merely sprays shots in the vicinity of the enemy produces little effect. These skills must be developed so that they are applied instinctively. During combat, the fundamentals of marksmanship must be applied in a limited time frame which corresponds to the size and the distance of the target."

It is no different with the non-kinetic fires of electronic warfare (EW) and computer network attack (CNA), as stated in Joint Publication 3-0, *Joint Operations*, "these skills must be developed so that they are applied instinctively." JP 3-0 also states "The fires function encompasses targeting, joint fire support, counter-air, interdiction, strategic attack, electronic attack (EA), and computer network attack (CNA)," so training the force to deliver those fires effectively and accurately should be common practice. Unfortunately, robust EW (specifically EA) and CNO (specifically CNA) integration and training efforts are woefully absent from the majority of Joint exercises. To many leaders, EW and CNO efforts are filled with the apparently eye-glazing "techno mumbo jumbo" that puts a majority of them (at every level) to sleep. Alas, we can no longer tolerate this reality. The Congressional EW Working Group points out, "Dominance in EW is essential for America to maintain its military superiority. EW provides access to the battlespace, degrades our enemy's capability to attack, and, most importantly, saves lives." It is time to realize we need more tangible, relevant Red Teams—or Opposition Forces (OPFOR)—to provide a *legitimate electromagnetic environment* (EME) that is representative of the enemy target set. Concurrently, we must abolish the bureaucratic barriers and status quo mindset that often manifests themselves in limited frequency clearances, specialized programs, and range space restrictions.

"...cellular technology represents a large portion of enemy C2..." (US Army)

Training

Why is it so difficult to incorporate focused training efforts into Joint exercises that are designed to force integration, synchronization and the ability to train like we fight? The simple answer is twofold; EW and CNO seem both complex and difficult to execute. The byproduct is that we are not fighting like we train because we are not training in a realistic EME. Therefore, we are not winning.

"Over the last several years, Congress and the Department of Defense have poured huge amounts of money into force protection and counter-IED equipment, but we are still fighting an uphill battle. A main reason for this is that our ground forces… lack comprehensive EW training, which enables our forces to effectively operate in the domain—the electromagnetic spectrum." (*Congressional EW Working Group,* April 2007)

Complexity

Decision makers seem unable to understand how emerging technology influences the battle space, which results in our constant reactive response to enemy tactics, techniques and procedures (TTP), such as cell phone detonators and 802.11 [wireless network standards] trigger devices. It is often impossible to get permission to operate and train against many EW/CNO targets, the majority of which are commercial off-the-shelf technology (COTS). Alternatively, if we had the proactive foresight to evaluate and train against new technologies, our forces would be better prepared.

Unwarranted fear of attribution and lack of support for legitimate EW/CNO training requirements also contribute to the problem. Here are some common examples:

- The US Federal Communications Commission bans high-powered cordless phone (HPCP)/long range cordless telephone (LRCT) transmissions, yet they represent a significant portion of enemy C2 and IED infrastructure.

- Cellular is a public domain and we are all aware of US Signal Intelligence Directive 18 rules and regulations. Nevertheless, cellular technology represents a large portion of enemy C2 and IED infrastructures.

-Wi-Fi is also a public domain and, like HPCP and cellular, it is a viable and thriving enemy battlespace.

These are not fantastic or ethereal

advanced technological concepts—they are real targets. Everyday we are operating and fighting in arenas influenced by these targets, yet we do not adequately train the force to engage them, operate near them or mitigate EM interference around them.

Difficulties in Execution

There are few EW ranges that appropriately depict what US forces will encounter in combat. The overwhelming majority of test and training ranges have significant limitations on what they can emulate and propagate for training versus EW/CNO targets. More often than not, antiquated frequency policies and red tape dictate what can and cannot be transmitted. Moreover, even if the range space and frequency clearances are available, the active and relevant targets are not. Not nearly enough tangible, relevant Red Teams exist to provide a legitimate, robust enemy EME. In many cases, frequency clearances are denied because of potential civilian infrastructure interference. These same concerns exist when we go to war, and should not limit or mitigate our training objectives and focus of effort. In combat, inevitable coordination/synchronization challenges are inherent to accurate delivery of non-kinetic fires, yet we do not provide our warfighters the ability to solve those problems, execute efficiently and deliver fires accurately because they cannot train to that standard. Returning to the aforementioned rifle analogy, figuratively speaking we provide our non-kinetic players with a rifle but no ammunition, inadequate targeting information, and a range that is open for 15 minutes every other Tuesday. We then expect them to effectively deploy to combat zones highly trained—with good sight alignment, trigger control, target discrimination, tight groupings and no fratricide—a preposterous requirement.

Limited EW/CNO focus by the Services, and an inability or unwillingness to interconnect capabilities precludes the existence of coordinated training environments. The *Congressional EW Working Group* identified the same shortfalls in April 2007:

"It's not only important for each Service to provide EW training, but each Service must be able to integrate its EW capabilities synergistically in a joint environment. In other words, it's not just about combining capabilities and operating effectively with each other. It's about operating together to produce a effect greater than any individual Service can produce, or simply the sum of Service EW capabilities."

Solutions

To address DOD-wide, Joint EW/CNO training and synergy issues, enter the Joint Forces Command (JFCOM) IO Range (IOR). The JIOWC Joint Electronic Warfare Center (JEWC)/JFCOM IOR initiative seeks to interconnect all test and training facilities (particularly the Joint Combat Training Centers) to create a live, virtual target country EME construct. The IOR will present emergent adversarial technologies, and will enhance EME training, TTP validation and training cost-efficiency. This makes it a potentially significant force multiplier, allowing intelligence and operations personnel and equipment to train like they fight. The IOR defines the "play" area in the information environment, also allowing planners to evaluate the potential for unintended effects throughout execution—as defined in Joint Pub 3-13.

To address target set issues, JIOWC, specifically the JEWC, provides robust, relevant adversary target sets, operational and technical expertise, and is incorporating ground, air, sea, and cyber EW capabilities. This provides the much-needed realistic EME in which to train. Examples of target sets include GSM cellular, 802.11 wireless, General Mobile Radio Service, Extreme Radio Service and various digital VHF and UHF push-to-talk systems.

As we move forward to resolve these EW and CNO training initiatives, the JEWC will continue to integrate current and emerging Joint EW effects for worldwide military operations by providing adaptive operational and strategic solutions. This fosters the coherent evolution of long-term electromagnetic capabilities, in order to ensure Global Spectrum Control across the range of military operations.